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## STATE WATER RESOURCES CONTROL BOARD RESOLUTION NO. 01-21-97

### POLICY FOR INVESTIGATION AND CLEANUP OF PETROLEUM DISCHARGES TO SOIL AND GROUND WATER

#### WHEREAS:

~~1. During the 1970's and 1980's ground water used for public water supplies in the South San Francisco Bay Area was contaminated by chlorinated hydrocarbon solvents discharged from leaking underground storage tanks (USTs).~~

12. Local, State and federal legislation in the mid 1980's led to broad programs for the registration and regulation of underground tanks used for storage of hazardous substances, including petroleum fuels.

23. Tens of thousands of single-wall steel tanks (and associated piping) used for storage and dispensing of petroleum fuels, installed underground in order to comply with local safety ordinances, and subject to natural corrosion in the soil for decades, were found to be leaking.

34. Discovery of such widespread fuel tank leakage, with the resultant discharge of hazardous petroleum constituents, such as benzene, to the environment, stimulated aggressive programs for cleanup, at significant cost to tank owner and operators.

45. In contrast to extensive contamination of drinking water wells from chlorinated solvent discharges, contamination of drinking water wells due to petroleum discharges from leaking USTs has been limited. Since 1985, fuel leaks have been reported at more than 30,000 UST sites in California. Fewer than 10 municipal wells from a sample of 12,000 had contamination attributable to a petroleum release from a UST. ~~Of the few Private domestic wells which have been affected, most that~~ are close to the a leaking UST and screened in a shallow aquifer are at greater risk than municipal wells. Discharges of petroleum from leaking UST's at approximately 130 sites have been reported to have affected domestic wells.

56. The State Board has received and considered comments and recommendations ~~from in a report prepared by the Lawrence Livermore National Laboratory (LLNL) in collaboration with the University of California and from the an~~ Advisory Committee appointed pursuant to H&SC 25299.38, including

strong recommendations for use of a risk assessment process that considers all available historical and site specific data to provide a systematic means to identify potential sources, pathways and receptors that contribute to or increase the risks from petroleum discharges.

67. The State Board held public meetings on May 2, 1996 and May 16, 1996 to receive comments on the LLNL report from interested persons regarding the cleanup of petroleum leaks and spills.

78. Petroleum, which includes crude oil and its fractions ~~the products derived from it~~ (e.g., gasoline, diesel, heating oil, stoddard solvent, bunker C oil) is made up of many naturally occurring hydrocarbon compounds, most of which ~~are only slightly water soluble~~; are relatively immobile in the subsurface environment, ~~and~~ The more water soluble natural hydrocarbon constituents of petroleum (benzene, toluene, ethyl benzene, and xylene) tend to degrade readily in the subsurface environment.

8. Benzene is the most water soluble natural hydrocarbon constituent of petroleum fuel and a known human carcinogen. Because of these properties, benzene has been the primary constituent of concern for cleanup of petroleum discharges in California. The maximum contaminant level for benzene in drinking water in California is one part per billion. The concentration of benzene in petroleum varies depending on the product. When in contact with water, the benzene fraction in petroleum partially dissolves creating a plume of dissolved benzene in the water body.

9. Most dissolved benzene plumes at UST sites located in the urbanized alluvial plains of the San Francisco Bay Area, Central Valley, North Coast and Los Angeles Basin extend no more than a few hundred feet from the point of release. The extent of these plumes typically is limited through the action of natural degradation/attenuation processes.

10. Most plumes of dissolved benzene in ground water are caused by liquid petroleum traveling through the soil and coming into contact with ground water. The presence of soil saturated with liquid petroleum indicates the possibility that liquid petroleum may have migrated, or may be migrating, to groundwater.

11. The trend of concentrations within a plume of dissolved petroleum constituents or additives in ground water generally can be determined based on analyses of ground water samples taken quarterly over a two year

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period if the samples are representative of the source area and the plume.

12. Although most petroleum discharges have been shown to have only localized impacts on ground water and to degrade naturally over time, it is prudent to establish protective criteria to assure the public that impacts remain localized and do not present a threat to human health, safety or the environment.

13. Decisions on the appropriate level of regulatory activity for a site at which petroleum has been discharged ~~should~~ must take into consideration the risk that pollution associated with the discharge will impair human health, the environment, and the existing and probable future beneficial uses of water.

14. At most sites with petroleum discharges, residual petroleum constituents will remain in soil, regardless of the degree of cleanup. The presence of such residual hydrocarbons in soil, under conditions set forth in Section II.C of this Policy, pose a low risk of adverse effects on human health, safety or the environment (including beneficial uses of water) and should not restrict use of the property provided that standard reasonable precautions are taken in the event of by those involved in any excavation, boring or related activities involving the subsurface.

15. A primary concern associated with leaving residual petroleum constituents in the soil is the possible accumulation of, and human inhalation exposure to, petroleum vapors in existing or new buildings. Except for very shallow releases or releases in highly permeable soils, such exposure is unlikely because concentrations of volatile petroleum constituents attenuate rapidly within the soil column as the vapors migrate upward from underlying residual petroleum constituents, resulting in negligible, if any, petroleum vapor concentrations detected at, or a few feet below, the ground surface. Indoor vapor concentrations in existing buildings overlying residual petroleum constituents in the subsurface environment are typically much lower than theoretical estimates based on current standard fate and transport modeling. Installation of vapor barriers during new building construction, which is common practice to prevent moisture transmission, provides redundant protection against vapor accumulation where new buildings are located near sites with petroleum discharges.

16. Methyl tertiary butyl ether (MTBE) is a gasoline fuel additive which was used sporadically in California during the 1970's and 1980's as an octane enhancer. In the early 1990's, MTBE was used as a wintertime

gasoline additive in air quality nonattainment areas to reduce automobile exhaust pollutant emissions. In 1996, the Air Resources Board required that all gasoline sold in California be oxygenated at a minimum of 2% by weight. The major oil companies have currently chosen to meet this requirement by reformulating gasoline to include MTBE at 11% by volume.

17. MTBE is more water soluble than benzene and, unlike fuel hydrocarbons, does not appear to readily degrade or ~~become~~ be retarded in the subsurface environment. Because of these characteristics, MTBE can travel more readily in ground water beyond the immediate vicinity of the source of the petroleum a discharge.

18. The U.S. Environmental Protection Agency (USEPA) has proposed a lifetime health advisory for the ingestion of MTBE in a range of 20-200 parts per billion. In 1992 the State Office of Environmental Health Hazard Assessment (OEHHA) issued a drinking water advisory of 35 parts per billion. The taste and odor thresholds for MTBE in water have been reported as are 40 and 50 parts per billion, respectively.

19. Creation and maintenance of a database of sites where residual petroleum constituents remain would inform subsequent site owners and assist ~~local agencies~~ other parties to ensure that standard reasonable precautions are taken during subsurface activities such as excavation or well drilling.

20. Petroleum discharges from USTs, aboveground tanks, pipelines, surface spills, or other sources have similar environmental impacts in similar hydrogeologic settings; therefore categorical criteria based on environmental fate data of petroleum hydrocarbons discharged from UST's at sites throughout California that are underlain by sedimentary deposits of clay, silt, sand, or gravel, or any combination thereof, can be relied upon in making determinations about appropriate regulatory actions for discharges of similar petroleum hydrocarbons at similar sites including aboveground tanks, pipelines and surface spills. The environmental fate of petroleum hydrocarbons at sites with fractured bedrock, or similar conditions, cannot be predicted reliably.

21. ~~The personal and economic costs of complying with the UST cleanup regulatory process have often had a profoundly negative impact on the economic and social well-being of many of the owners and operators of USTs.~~

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**2122.** The legislature directed the State Board to adopt regulations for cleanup of petroleum discharges from USTs. Section 25299.38 of the Health and Safety Code (H&SC) requires the State Board to consider changes in cleanup standards for investigation and corrective action regarding unauthorized discharges of hazardous substances "to ensure that cleanup standards that are both technologically feasible and necessary to ensure the protection of human health, safety and the environment," and to promote statewide consistency in the regulation of such cleanup by Regional Water Quality Control Boards and local agencies. It also is important that public and private resources be spent only on cost-effective cleanup that is necessary to ensure protection of human health, safety and the environment.

**2223.** Maintaining the high quality of waters is best achieved by prevention of leaks and other discharges through strong enforcement of leak detection and monitoring requirements by state and local agencies together with UST upgrade or replacement. Both State law and federal regulations require that USTs be upgraded or replaced by December 22, 1998.

## **THEREFORE BE IT RESOLVED:**

### **I. GENERAL PROVISIONS**

**A.** Notwithstanding any other policies adopted by the State Board, this Policy shall govern regulatory actions of regional water quality control boards and local agencies for discharges where:

- (1) The discharge consists only of petroleum or petroleum products;
- (2) The petroleum was discharged to soil or to ground water; and
- (3) The discharge is located in an area with alluvial geology underlain by sedimentary deposits of clay, silt, sand, or gravel, or any combination thereof.

**B.** The principles articulated herein may be extended to petroleum discharges to soil and ground water in other geological environments under appropriate circumstances.

**C.** This Policy does not preclude a regional water quality control board or local agency from determining, based upon site-specific data, that a discharge that does not satisfy these "low risk" criteria is, nevertheless, a "low risk" discharge. Any such determination by a

local agency shall not take effect until it has been submitted to the appropriate regional water quality control board for review and the regional water quality control board does not object in writing within 30 days of receipt of the proposed determination.

**D.** This Policy does not preclude a regional water quality control board from issuing orders for the cleanup or abatement of a waste discharge pursuant to Section 13304 of the Water Code for any discharges including those that appear to satisfy the "low risk" criteria. if, based upon site-specific data, the regional water quality control board determines that the discharge impairs or threatens to impair existing or probable future beneficial uses of water. Any such order issued by a regional water quality control board is appealable to the State Board in accordance with Section 13320 of the Water Code. Any such determination by a local agency must be confirmed by an order issued by a regional water quality control board.

**E.** No regulatory action is required for This policy does not apply to minor spills (less than 5 gallons) of petroleum or petroleum products to the ground surface.

**F.** If ecological receptors are affected by the discharge, a risk assessment and necessary cleanup or abatement shall be conducted.

**G.** Nothing in this policy shall be construed or interpreted to affect any private obligation, liability, claim, or right of action arising out of any discharge of petroleum.

### **II. SPECIFIC PROVISIONS**

#### **A. Source Removal**

The source of the discharge shall be removed, closed or repaired at all sites. In addition, soil saturated with petroleum in the immediate vicinity of the source shall be removed where practicable and properly treated or disposed of.

The health risk due to ingestion of, or dermal contact with, soil affected by the discharge shall be reasonably abated for surface and near surface discharges.

No further regulatory action shall be required if the discharge is so minor that source removal results in substantially complete removal of all petroleum discharged.

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**B. Initial Site Assessment For Risk Categorization**

If removal of the source and saturated soils as described in Section II.A does not accomplish substantially complete removal of petroleum, an initial site assessment shall be required in order to develop a conceptual model of the discharge and its surrounding environment. The initial site assessment shall include, but not be limited to the following: (1) data on the nature and estimated quantity of release; and (2) data on the surrounding populations, water quality, use and approximate locations of wells and surface water bodies within one half mile of the discharge, subsurface soil conditions and hydrogeology, locations of subsurface utilities and other preferential pathways, climatological conditions, and land use. Information from previous investigations at nearby sites and other available sources should be used to the extent possible. The conceptual model developed for the site should guide the placement and number of borings, wells and samples taken to characterize the release. As new information becomes available, the site conceptual model should be updated to include the new information.

The initial site assessment shall include any investigation, including boring, sampling and analyses needed to determine the presence of soils saturated with petroleum beyond the immediate vicinity of the source and to determine whether a sufficient buffer of petroleum-free soil exists for the site to qualify as "low risk" in accordance with Section II.C.2. (At UST sites this will generally entail analyzing soil samples from below the lowest point of any excavation undertaken to remove the source and any saturated soil, taken from no more than three borings locations at a lateral distance of no more than 10 feet from the source or boundary of the excavation of the discharge. More extensive boring, sampling and analyses may be appropriate at the site of large or complex discharges.)

Ground water sampling beneath the source of a discharge shall be required if the conditions of Section II.C.2 are not satisfied. At UST sites this will generally entail analyzing ground water samples from three monitor wells constructed at or near the soil borings. At all sites where gasoline was discharged and soil and ground water samples are taken to determine the presence of benzene, such samples shall be also analyzed for MTBE where it is likely that the gasoline contained MTBE. The results of ground water sampling shall be compared against the criteria in Section II.C.3.

Where buildings overlie soil or ground water affected by the discharge of petroleum, and there is reason to believe that petroleum vapors may enter and adversely affect the occupants of such buildings, a soil vapor analysis shall be required. The results of the soil vapor analysis shall be compared against the criteria in Section II.C.1.

**C. Low Risk Criteria****1. Low Risk Inhalation Exposure Sites**

No further regulatory action to abate the effects of petroleum vapors shall be required if measured petroleum vapor concentrations in soil at depths of 0-3 feet beneath, or immediately adjacent to, a building overlying the soil or ground water affected by the discharge have attenuated from higher concentrations at lower depths to "non-detect" insignificant levels at depths of 0-3 feet below the ground surface.

**2. Low Risk Soil Only Sites**

No further regulatory action shall be required if:

- (a) there is no soil saturated with petroleum from the discharge; and
- (b) there is no detectable petroleum in the soil within 20 vertical feet of waters of the state.

**3. Low Risk Ground Water Sites**

No further regulatory action shall be required if the maximum concentration of MTBE in ground water affected by the discharge does not exceed 35 parts per billion, there is no soil saturated with petroleum in contact with ground water, no drinking water well or surface water body has been affected by the discharge and either of the following conditions are met:

- (a) the maximum concentration of benzene in groundwater affected by the discharge does not exceed one part per **billion**; or
- (b) there is no surface water body or drinking water well within 750 feet of the source of the discharge and the maximum concentration of benzene in ground water affected by the discharge does not exceed one part per **million**.

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## D. Additional Site Assessment and Corrective Action

If the discharge does not satisfy the criteria in Section II.C for low risk sites, risk reduction measures or additional site assessment shall be required to develop a more comprehensive and detailed conceptual model of the discharge. No further regulatory action shall be required, following the implementation of risk reduction measures or more complete site assessment, if, with the approval of the regional water quality control board or local agency, any of the following conditions are satisfied:

(1) Any inhalation risk is abated and the concentration of benzene hydrocarbon compounds from the discharge in any affected drinking water well is less than one part per billion water quality objectives; and the concentrations of benzene hydrocarbon compounds within the plume from the discharge remain constant or decrease over time; and the concentrations of MTBE within the plume from the discharge remain constant or decrease over time such that the concentration at any affected drinking water well is less than 35 parts per billion or any future health-based concentration recommended by OEHHA; or

~~(2) active cleanup measures lower the concentrations of benzene and MTBE and petroleum vapors to conditions that satisfy the low risk criteria in Section II.C; or~~

~~(3)(2) engineering or institutional controls reasonably abate the risk to existing human health, the environment and beneficial uses of water; or~~

~~(2)(3) active cleanup measures lower the concentrations of benzene and MTBE and petroleum vapors to conditions that satisfy the low risk criteria in Section II.C or the criteria in Section II.D.(1) or II.D.(2).~~

## III. DATABASE

The State Board shall create and maintain a database shall be created in accordance with SB 562. The database shall include information provided by regional water quality control boards and local agencies and

apply to all discharges of petroleum subject to this policy.

## IV. APPEALS PROCEDURES

Any action or inaction related to this policy by a regional water quality control board is appealable to the State Board in accordance with Section 13320 of the Water Code.

## V. IV-DEFINITIONS

The following definitions shall apply to terms as used in this policy:

“Regulatory action” means any action by a regulatory agency requiring investigation, characterization, removal, or cleanup of a discharge of petroleum, or abatement of the effects of a discharge.

“Soils saturated with petroleum” means that the pore volume between soil particles is substantially at least 51 percent filled with liquid petroleum.

“Source” means the physical container from which petroleum has been released (discharged) to the environment. A source can include, but not be limited to, either a UST or an aboveground tank and associated piping, or a pipeline. This term does not include soil containing or saturated with petroleum.

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